

# Knotweed Biology and Control

## King County Noxious Weed Control Program

### Description and Identification

Very tall, robust members of the buckwheat family (Polygonaceae) from Asia:

Japanese Knotweed (*Polygonum cuspidatum*)

--smaller in stature (6 feet usually)

--leaf bases are flat, not heart-shaped

--most clones in US are female (flower clusters hanging down)

Giant Knotweed (*Polygonum sachalinense*)

--tallest species, up to 15 feet

--leaves very large all with heart shaped bases

--most clones in US are female (flower clusters hanging down)

Bohemian Knotweed (*Polygonum x bohemicum*)

--naturally occurring hybrid between the other two

--medium tall (8 to 12 feet), mixed leaf shapes

--introduced as an ornamental separately

--most clones were male (flower clusters upright)

--recently females have been showing up with viable seeds

--most common type of knotweed found in the PNW

Common names include: elephant ear bamboo, false bamboo, and fleecflower

Scientific names include: Japanese knotweed (*Polygonum cuspidatum*, *Fallopia japonica*, *Reynoutria japonica*) giant knotweed (*P. sachalinense*), Bohemian hybrid (*P. X Bohemicum*)

Identifying Characteristics:

- Hollow, upright, bamboo like stems
- Large, smooth-edged leaves, growing alternate on stems (not opposite)
- Stems often reddish or red-speckled
- Young shoots look similar to red asparagus
- Small white or greenish flowers grow in dense clusters from the leaf joints in July and August
- Dies back to the ground after hard frosts
- Hard, dry, brown stems may persist through the winter

### Basic Knotweed Ecology

- Typically starts growth in April, earlier in warm areas
  - May start as late as June at higher elevations
  - Stems from deeply buried roots may emerge in late summer
- Grows extremely fast during the spring
  - Giant knotweed can reach 15 feet by June
  - Bohemian or Japanese knotweed reaches “only” 10 feet or so
- When knotweed is cut or damaged, it vigorously and rapidly resprouts from latent buds on root crowns and rhizomes
- Rapid upward growth slows in July and is much reduced after August
- Dies back to the ground with the first hard frost, and returns each spring from the same root system

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- Extensive roots can spread 20 feet from the parent plant and penetrate 7 feet down into the soil
- Seedlings have been found but this is probably not the primary means of spread
- Can spread rapidly due to its ability to reproduce vegetatively
  - Root and stem fragments, as small as 1/2" can form new plant colonies
  - Cut or broken stems and roots will sprout if left on moist soil or put directly into water
  - Fragments are spread by beavers, earth moving equipment, in contaminated fill material and most commonly by floods or high water
- Seasonal high water events and floods sweep plants into rivers and creeks, then fragment and disperse knotweed plant parts throughout the floodplains and cobble bars
  - Fast growing knotweed then takes advantage of the freshly disturbed soil to become established
  - Because it grows faster than most other plant species (including native species and most other weeds) it quickly outgrows and suppresses or kills them.
- Roadside ditches, irrigation canals, and other water drainage systems can be colonized the same way
- Despite knotweed's large rhizome mass, it provides poor erosion control.

## General Control Issues

NOTE: Information in this section was based on a detailed paper on knotweed control called "**Controlling Knotweed (*Polygonum cuspidatum*, *P. sachalinense*, *P. polystachyum* and hybrids) in the Pacific Northwest**" written by Jonathan Soll, The Nature Conservancy, 01/16/2004. Control recommendations have been adjusted based on the field experiences of our program and others. This handout should only be used for informational purposes. For more details please see the original document at <http://tncweeds.ucdavis.edu/esadocs/polybohe.html>.

1. It is possible, but not easy, to control knotweed, especially at a landscape scale.
2. Because of knotweed's incredibly extensive root system and sprouting ability, landscape level control requires long term planning and follow up.
3. Because the plant spreads downstream by water, need to work from the top of the waterway down and include tributaries and other upstream sources of possible re-infestation
4. Even on a patch-by-patch basis, successful eradication is likely to take several years and multiple treatments.
5. Although there are potentially successful mechanical or manual control options for small patches, landscape level projects and large sites will almost certainly require integrating herbicide use into a control strategy.
6. Outreach to all public and private landowners and the broader community, as well as volunteer recruitment and coordination, will improve the success of large landscape level projects
7. You may also want to work with volunteers and other organizations in your community to expand your ability to physically get the work done.
8. Landscape level projects may be easier with an umbrella coordination effort such as a CWMA
9. Grants are available for invasive removal that benefits public resources especially for work done through non-profit organizations or government agencies

## Mechanical or Manual Control

- **When to use manual methods:** If you have easy access to your site, the patches are reasonably small (perhaps 50 stems or less) and you can commit to following an intensive control regimen
- Be aware that repeated cutting tends to produce numerous small stems, which may make future treatment with stem injection more difficult.
- Cutting and pulling stimulates shoot growth and depletes the roots and the more shoots there are per linear foot of root, the more likely you will be to be able to physically pull the roots out, exhaust them by depriving them of energy (i.e. by cutting the shoot off) or finish them off with an herbicide treatment
- If you do try and control knotweed manually, be sure you practice the four T's: be timely, tenacious, tough and thorough

### Manual/Mechanical Methods:

1. Dig up as much root as possible in August over at least three consecutive years; reported to work for small, isolated patches
  - a. Be sure to carefully dry or dispose of the roots
  - b. Do not put them in a compost pile – discard with garbage or take to landfill
    - i. In England, soil contaminated with knotweed roots is considered an environmental contaminant and needs to be buried 3 meters (10 feet) deep.
  - c. Be sure to search at least 20 feet (7 meters) away from the original patch center.
2. Cut stems close to the ground **TWICE A MONTH OR MORE** between April and August, and then once a month or more until the first frost, over 3 to 5 consecutive years
  - a. Try to keep plants from growing taller than 6 inches
  - b. Hand held tools are best but for large sites using a mower/weed-eater is an option if set close to the ground and if cut fragments are contained
  - c. Rake and pile up the cut stems away from water where they will dry out, because stems or stem fragments can sprout, and the area (or adjacent areas) may become re-infested
  - d. If stems are chipped, stem sections should be 5 cm long or less and stem sections should be spread thinly on the soil surface to discourage rooting
  - e. Do not allow cut, mowed or pulled vegetation to enter waterways
3. Cover with heavy duty geotextile fabric or black plastic
  - a. Works better with isolated and smaller patches on open terrain
  - b. Plan to leave the covering material in place throughout three to five growing seasons
  - c. Install covering at the beginning of the year or after you've cut the plant down several times during the growing season and reduced some of the rapid plant growth
  - d. First cut stems down to ground surface
  - e. Cover the knotweed infested area with geotextile fabric or heavy duty black plastic expanding beyond the plant base and stems at least 10 feet beyond the outside stems
  - f. Make sure there are no gaps. Overlap at least 4 to 5 feet if possible.

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- g. Secure the covering material with heavy rocks or concrete blocks.
- h. Check the fabric at least once a month and repair any holes or disturbed fabric. Stomp down any knotweed pushing up the fabric and break off any sprouts emerging around the edges of the covered area.
- i. Leave covering on for at least one season after no growth is observed under the material.

## Chemical Control

### General Issues

- Use an herbicide product labeled for your site
  - e.g. aquatic, non-crop/right-of-way, home and garden, pasture, forestry
- Follow label rates – more is not necessarily better!
- Always read and follow label instructions
  - PPE: safety glasses, chemical proof gloves, long sleeves and pants
- May need an NPDES permit from Dept of Ecology or WSDA
  - If there is any chance of herbicide getting into water
- Product names are provided for information only and are not intended as a recommendation

### Timing

- From flower bud to seeding stage (usually July to September)
- Height can be challenging for foliar applications so it's best to cut or bend stems and let stems regrow to 3 to 6 feet tall (usually takes at least 4 weeks)
  - Short plants: easier to reach with spray but may not have enough leaf surface to absorb and translocate enough chemical to be effective
  - Taller plants: more drift potential and harder to get complete coverage on tall plants

### Foliar Applications

- Backpack sprayer, large volume sprayer
- Higher risk of drift onto desirable vegetation and into water, soil
- Easiest and fastest method
- Use systemic herbicide – translocates from leaves to roots
  - Glyphosate: 2 to 8 % solution
    - Aquamaster/Rodeo plus surfactant (LI-700, Agridex) – aquatic sites
    - Roundup Pro (has surfactant mixed in) – non aquatic sites
    - Non-selective – will harm all actively growing plants if leaves are sprayed
    - Repeat applications may be needed
    - More effective when combined with imazapyr
  - Imazapyr
    - Habitat – aquatic
    - Arsenal - non-aquatic sites
    - slow-acting and expensive but highly effective

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- taken up by leaves and roots; stays active in soil for at least several months (wait one year before planting in treated area)
- can be used alone or in combination with glyphosate
- Triclopyr
  - Renovate – aquatic sites
  - Garlon 3A – non-aquatic sites
  - Selective – will not harm grass, rushes, cattails, etc
  - Quick acting but not as effective as glyphosate or imazapyr
- Combo method: spring or summer spray or cut followed by fall foliar spray
  - Sets plants back so they can be sprayed at the appropriate growth stage and at the best height
  - Cutting first instead of spraying will reduce overall herbicide input into the watershed and is probably more labor efficient (can use volunteers or unlicensed crews)

### Stem Injection

- Use stem injection gun or similar tool
  - Also need marker paint or marker and a cork for the needle
  - Follow directions carefully especially calibration and cleaning
- Highly effective: 95% or more controlled in first year
- Greatly reduces drift and highly selective
- No cut stems to deal with
- Very time and labor intensive compared with foliar spraying
  - Need to inject every cane in the stand
- Can only inject stems over ½ inch so there will always be small stems that can't be injected in a population, especially in the second year of treatment
- Inject 3 to 5 ml into stem between first and second nodes or between second and third node if too woody lower down
  - Glyphosate label typically limits use to 2 gallons per acre so can only inject about 2500 stems per acre
- Timing best from mid-June to end of September
- Currently only Aquamaster and Roundup Pro Concentrate are labeled for stem injection

### Cut Stem/Pour Applications

- Similar to stem injection with the injection gun, may not be as effective
- Good for small patches
- Greatly reduces drift
- Cut stems between lowest 2 nodes
- Put 3 ml undiluted (concentrated) glyphosate into stem cavity
  - Can use a large needle with measured reservoir to be precise
  - Be very careful not to splash out onto the ground
  - Follow label directions on amount applied per acre (for the 2 gallons per acre label can only inject 2500 stems per acre)
- Timing best in late summer or early fall

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- Need to remove cut stems away from water where they can dry out and not spread off site

### Wick Wipe Method

- Uses an applicator with a sponge on the end of a reservoir for the herbicide
- Use glyphosate or triclopyr at 33 to 50 % concentration
- Greatly reduces drift
- Hard to get chemical on leaf surface and seems to increase personal contact with herbicide

### Additional Resources

Child, Lois and Max Wade. 2000. *The Japanese knotweed manual - the management and control of an invasive alien weed*. Packard Publishing Limited, Chichester. 123p

This is a comprehensive guide to designing and executing a Japanese knotweed control program from folks in Great Britain.

The Nature Conservancy Wildlands Invasive Species Website: ([tncweeds.ucdavis.edu](http://tncweeds.ucdavis.edu))

This website has a wealth of information on exotic species control, and tools, and includes a review of knotweed control literature. The knotweed page is found at <http://tncweeds.ucdavis.edu/esadocs/polybohe.html>.

Washington Department of Agriculture (360-902-1922,  
<http://agr.wa.gov/PlantsInsects/Weeds/Knotweed/Knotweed.htm>)

Herbicide labels and product registration status, knotweed information, pesticide applicator license information, info on permits for aquatic applications.

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Author of the Knotweed Control paper this handout is based on. Also the contact for details of control experiments and outreach materials, and information about the Knotweed Working Group.

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For details of their work on stem injection and the stem injection guns.

For injection tool information/ordering: <http://www.jkinjectiontools.com>

For Aquamaster label/supplemental label:

<http://www.monsanto.com/ito/products/aquamaster.html>

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